Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2014; 2(6F):3270-3273 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com **DOI:** 10.36347/sjams.2014.v02i06.081

Research Article

Assessment of Serum Levels of Bone Metabolism Biomarkers in Sudanese with HIV Infection

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Abstract: Bone metabolism disorders with increased fractures rate are common among HIV infected patients**.** This study was aimed to assess serum levels of bone metabolism biomarkers in Sudanese HIV infected patients. In a Hospital-based matched case control study conducted during the period from March 2014 to October 2014, blood specimen was collected from 50 individual with HIV infection and 30 healthy individuals and serum levels of bone metabolism biomarkers PTH, calcium , phosphorous and Alkaline phosphates activity was measured using spectrophotometrical methods. Data were collected using structural questionnaire. Data analysis was carried out by means of statistical package for social science (SPSS version 16). The mean level of PTH was significantly higher in HIV infected patients compared to healthy individuals (p value = 0.03). There were no significant differences in serum levels of calcium, phosphorous and Alkaline Phosphatase activity between HIV patients and healthy individuals (p value > 0.05). Serum level of phosphorous significant positively correlated with duration of HIV infection and negatively with age while other biomarkers did not correlate. HIV infection is associated with increased level of PTH.
Keywords: HIV, Sudanese, bone metabolism biomarkers.

INTRODUCTION

Bone diseases are common complication in HIV infected patients [1] with increased fracture rates [2]. Many factors, such as low intake of calcium and vitamin D, depression and cigarette smoking, are contributed to increased prevalence of this disease. Many studies reported that antiretroviral therapy may also be related to bone diseases in HIV patients. The parathyroid glands are significant in bone health because of their control of calcium and phosphorus metabolism, which in turn are critical for development and maintenance of healthy bone [3]. Bone is made primarily of collagen, a protein that provides a flexible "framework," Calcium and phosphate, a mineral compound that gives bone its strength and hardness [4].

Parathyroid Hormone PTH is a polypeptide synthesized and secreted by the parathyroid gland which regulates plasma Ca2+ and PO4 [5, 6] by sensing protein in the cell membrane of the parathyroid cells the receptor permits variations in the plasma Ca2+ concentration to be sensed by the parathyroid gland, leading to the desired changes in PTH secretion [7, 8].

Many studies reported alteration of serum levels of bone metabolism biomarkers in the HIV infected patients [9, 10]. The Understanding the relation between bone density abnormalities in patient infected with HIV virus, opening the way to reduce the complications and helping in eradication of bone disease. This study was designed to evaluate serum levels of bone metabolism biomarkers in Sudanese people infected with HIV.

MATERIALS AND METHODS

This study was done in Khartoum Teaching Hospital and Omdurman Maternary Hospital in Khartoum state during the period from March 2014 to October 2014. A total of 50 patients diagnosed with HIV infection as test group and 30 healthy apparently healthy individuals as a control group were recruited for this study. Both groups were gender and age matched. Those with renal failure, liver disease and other disease affecting bone metabolism biomarkers were excluded from the study. Permission of this study was obtained from to local authorities in the area of the study. An informed consent was obtained from each participant in the study after explaining objectives of the study. Interview and questionnaire was used to collect data. 5

ml of venous blood was collected from each participant. Serum was separated directly from the plain container by centrifugation at (300 rpm) for 5 minutes. Serum levels of calcium, phosphorous and alkaline phosphates activity were determined using spectrohometrical methods. Calcium was measured by BioSystems clinical chemistry kit (Barcelona, Spain).

Phosphorus was determination performed using BioMED Diagnostics clinical chemistry (Hannover, Germany). Alkaline Phosphatase activity measurement was done by using BioMED Diagnostics clinical chemistry (Hannover, Germany). Parathyroid hormone determination of the concentration of Parathyroid hormone was performed using DIAsource Immunoassays (Nivelles – Belgium).

Statistical analysis was performed using statistical package for windows (SPSS v16). Fisher's exact test was used to assess the categorical variables and student *t*-test or kruskal Walis for continuous variables. Correlation between quantitative parameters was assessed with Pearson correlation test. Data are presented as mean ± standard deviation (SD). p value less than 0.05 was considered statistically significant.

RESULTS

Fifty HIV infected individual and 30 age and gender matched healthy individual as control were included in this study. Most of HIV patients were female (70%). The mean of age per year for HIV patients was 35.5 ± 7.7 (27 ~ 61). The duration mean per year for HIV infection was 4.2 ± 3.6 (0.25 ~ 17).

As demonstrated in (Table 1), the PTH was significantly increased in HIV patients compared to healthy individuals (P. value = 0.03). There were no significant differences serum levels of calcium, phosphorous and Alkaline Phosphatase activity between HIV patients and healthy individuals (p value > 0.05). There was no significant variation between male and females with HIV in serum levels of PTH, calcium, phosphorus or Alkaline Phosphatase activity (Table 2). In HIV patients, serum level of phosphorous significant positively correlated with duration of HIV infection and negatively with age (p value < 0.05). There were no correlation between age and duration of HIV with serum levels of PTH, calcium and Alkaline Phosphatase activity (Table 3 and 4).

Table 1: Comparison of chemical parameters level between HIV patients and healthy individuals (mean ±SD)

	HIV patients (n= 50)	**Healthy individuals (n= 30)**	**p value**
Alkaline phosphates	222.6 ± 117	224.5 ± 91	0.92
Calcium (mg/dl)	8.7 ± 0.7	9.1 ± 0.8	0.09
Phosphorous(mg/dl)	5.1 ± 1.4	5.4 ± 1.4	0.28
Parathyroid hormone (pg/ml)	30.3 ± 0.7	24.5 ± 0.7	0.03

Table 2: Comparison of plasma levels of PTH, calcium, phosphorous and Alkaline Phosphatase between male and females with HIV (mean ±SD)

	Male HIV patients (n= 16)	**Female HIV patients (n= 34)**	**P value**
Alkaline phosphates	224.6 ± 117	227.5 ± 91	0.90
Calcium (mg/dl)	8.6 ± 0.5	8.8 ± 0.8	0.44
Phosphorous(mg/dl)	5.3 ± 1.4	5.02 ± 1.4	0.47
Parathyroid hormone (pg/ml)	31.4 ± 9.0	29.7 ± 10.2	0.59

Table 3: Correlation of HIV duration and plasma levels of PTH, calcium, phosphorous and Alkaline Phosphatase

	R	p value
Alkaline phosphates	-0.03	0.81
Calcium (mg/dl)	0.08	0.57
Phosphorous(mg/dl)	0.31	0.02
Parathyroid hormone (pg/ml)	-0.17	0.24

Table 4: Correlation of age of HIV patients with plasma levels of PTH, calcium, phosphorous and alkaline Phosphatase

	R	**p value**
Alkaline phosphates	0.02	0.87
Calcium (mg/dl)	-0.02	0.84
Phosphorous(mg/dl)	-0.29	0.01
Parathyroid hormone (pg/ml)	0.10	0.34

DISCUSSION

In this study 50 HIV infected individual and 30 age and gender matched healthy individual as control were evaluated for bone metabolism biomarkers levels in the serum. Serum level of PTH was found to be significantly increased in HIV patients compared to healthy individuals (p value = 0.03). There were no significant differences serum levels of calcium, phosphorous and Alkaline Phosphatase activity between HIV patients and healthy individuals (P. value> 0.05). This finding was in agreement with other studies conducted [11-13] who reported that there was significant association with PTH and no significant differences in serum levels of calcium, phosphorous and Alkaline Phosphatase activity between HIV patients and healthy individuals. Also Schuettfort G *et al*.; [14] who observed that A significant increase in phosphorus levels were observed between patients with HIV and control group. Our findings are disagreed with study carried out by [15, 16] who observed that the serum level of PTH was significantly decreased in patient with HIV. The differences between our result and these results may due to the difference of method used for investigation and sample size.

Recently, Todd Brown of Johns Hopkins University and Roula Qaqish of Abbott Laboratories noted increase Bone metabolism disorders in 67% of HIV positive study participants [17] with some data suggesting a relationship with HIV treatment (i.e. Tenofovir therapy) and increased parathyroid hormone levels, especially in patients with low levels of vitamin D [18].

According to our finding there is statistically significant association between age and phosphorus among HIV patient while there was insignificant with calcium, PTH and Alkaline Phosphatase this result is not similar to study conducted by Schuettfort G *et al*. [14] who reported that there is significant correlation of age and PTH among HIV patient.

Our findings showed insignificant relation between gender and calcium, phosphorus, PTH and Alkaline Phosphatase among HIV patient. This finding has been substantiated by Bech A *et al*. [15] and Haug CJ *et al*. [16] who observed that there was insignificant correlation between gender and PTH and Alkaline Phosphatase.

CONCLUSION

This study established that serum level of the PTH was significantly increased in HIV patients compared to healthy individuals while there were no significant differences serum levels of calcium, phosphorous and Alkaline Phosphatase activity between HIV patients and healthy individuals.

There is significant correlation of age with phosphorus, while there was no significant variation between male and females with HIV in serum levels of PTH, calcium, phosphorus or Alkaline Phosphatase activity. Early diagnosis for Bone metabolism disorder by determination for Vitamin D, PTH, Calcium, Phosphorus, and Alkaline Phosphatase levels are recommended for HIV patients.

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